

# **Evaluating the Potential for Risk Compensation with the New Generation Fire Shelter**

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**Missoula, Montana**

**March 2003**

Schindler, J.D. 2003. Evaluating the potential for risk compensation with the new fire shelter. Tech. Rep. 0351-2804-MTDC. Missoula, MT: U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center.

Considers the possibility that firefighters might be inclined to take greater risks when fighting wildfires because they are carrying an improved fire shelter. This possibility, known as risk compensation, has been studied extensively in relation to improvements in highway and vehicle safety. Essentially, drivers increase risk taking and disregard conventional safety practices proportionately to improvements in highway and vehicle safety. Experienced firefighters contacted by the author of this report felt that some firefighters might take greater risk because they were carrying an improved fire shelter. The author suggests several strategies for reducing the possibility of risk compensation when firefighters carry the new fire shelters.

Keywords: fire fighting, firefighting, psychological factors, safety at work, safety devices

## Table of Contents

Introduction.....	3
Fire Shelters and Risk Compensation.....	4
Considerations for Mitigation.....	5
Recommended Mitigation Actions.....	7
Internal Actions.....	7
External Actions.....	8
References.....	9

## **Introduction**

Fire shelters are one of the most important pieces of personal protective equipment (PPE) wildland firefighters are mandated to carry. There has been much discussion, and some research, about the possibility that firefighters may take increased risks because they are carrying fire shelters.

Accordingly, when firefighters carry shelters, they may accept assignments with a lower probability of success, stay too long in deteriorating conditions, become lax in identifying escape routes and safety zones, or fail to monitor changes in fire behavior.

This possibility is commonly called risk compensation. Risk compensation is also known as danger compensation, risk-affecting behavior, perverse compensation, or more formally as risk homeostasis theory.

Most of the information and research on risk compensation deals with highway and vehicle safety improvements and drivers' responses to them. Essentially, drivers increase risk taking and disregard conventional safety practices proportionately to improvements in highway and vehicle safety. Are there parallels to wildland firefighting situations with the potential for similar risk compensation behaviors by firefighters? I interviewed a number of veteran field personnel involved in wildland and prescribed fire to determine if they felt this was the case, and if so, what could be done to reduce this possibility.

No proof exists that firefighters take more risks as a direct result of carrying a fire shelter. However, some evidence suggests that the possibility exists.

An improved fire shelter will be available during the 2003 fire season. If firefighters take more risks because they are carrying the new shelter, the result could be more entrapments.

## **Fire Shelters and Risk Compensation**

In 1997, Dr. Curt Braun and Jason Fouts, both of the University of Idaho, conducted a study for the Missoula Technology and Development Center to determine whether firefighters were prone to accept greater risk when they carried a fire shelter. Their study suggested that "...firefighters may not be immune to the effects of risk compensation," and that firefighters' perceptions of fire danger may be reduced while carrying the shelter.

Most discussion of this topic is based on risk compensation theory (Peltzman 1975) and risk homeostasis theory (Wilde 1994). Risk homeostasis theory had its genesis in highway and vehicle safety studies. Wilde defines the theory as: "the degree of risk-taking behavior and the magnitude of loss, due to accident and lifestyle-dependent disease, being maintained over time unless there is a change in the target level or risk." He further defines target risk as: "the level of risk a person chooses to accept to maximize the overall expected benefit from an activity." Wilde postulates that safety intervention feedback, together with anticipation, lead to adaptive behavior that has a stabilizing effect on accident risk, even when the technology itself is safer.

Geller (1995) cites studies by Peltzman, Adams (1978), and Streff (1987) dealing with drivers' risk behavior in response to safety measures as support for the theory of risk compensation. Noland (1995) clearly demonstrated the effect of risk compensation in a study of transportation systems. Filley (1999) provides arguments to support risk homeostasis theory. He validated the theory in studies of safety measures such as air bags and antilock brake systems. He also considers the applicability of the theory in other contexts, such as cycling, the use of childproof medicine bottle caps in the home, safety regulations in the workplace, and playground safety.

Not all research supports risk homeostasis theory. Wong and Nicholson (1992) conducted research regarding drivers' risk compensation behavior on horizontal curves. Rock (1993) conducted more studies on seat belt use and risk compensation. No demonstrable compensation effects were found. Evans (1986a) appears to be the most critical disbeliever of risk homeostasis theory. He evaluated highway fatality data from the United States and Japan, concluding that the evidence refuted the theory. Wilde (1986) suggested that Evans failed to consider all appropriate data when evaluating the theory.

At this time, it appears that more information supports the hypothesis of risk compensation than discounts it. The study by Braun and Fouts appears to be the only study that specifically addresses the question of risk homeostasis theory and fire shelters. They found evidence for risk compensation, although the risk compensation behavior appeared to be small.

When eight veteran Forest Service firefighters were polled regarding the question of fire shelters and risk compensation, they dismissed the idea of risk compensation. Most of the veteran firefighters felt that if this phenomenon were occurring, it would be occurring predominantly among the newer and less experienced firefighters. The lack of experience, rather than the lack of training, was the most frequent reason they gave for any increased level of risk taking (Cunningham, Gardner, Graves, Hollenshead, Hupp, Lockwood, Phenix, Rogers 2002).

However in his study, Dr. Braun cautioned, “In wildland fire, a change of even the smallest magnitude might mean the difference between a successful escape from a fire and an entrapment.” Further, “In a fire situation with potential for extreme fire behavior, small changes in human behavior can adversely affect the safety of entire firefighting crews.”

The existing research data, the available relevant information, and the opinions of experienced firefighters suggest some support for the hypothesis that carrying a fire shelter might lead firefighters to take increased risks.

## **Considerations for Mitigation**

Because of the possibility of fire shelter-induced risk compensation, fire managers need to consider how to mitigate this problem when firefighters are provided a new, improved fire shelter.

Researchers have considered how to reduce problems caused by risk compensation in other settings.

Most researchers, notably Wilde (1994), Geller (1995), Filley (1999), and Putnam (2000) agree that the traditional “Triple E” (engineering, education, and enforcement) approach is ineffective. When individuals value the future more than the present, they will want to arrive at the future in the appropriate health and condition to enjoy it, Wilde says. Geller talks about value change, saying “...our vision should be to make safety a value, not a priority. When safety becomes a value, tolerance for risk will not change as a function of protective equipment.” Filley proposes that policy changes should reward safe behavior and increase “penalties for unsafe behavior.”

Mangan (1999) stresses individual responsibility as the first component of a successful program to reduce fatalities and injuries. Personal protective equipment is another component. Mangan emphasizes that all firefighters are ultimately responsible for their own safety and well-being, and that areas such as physical fitness and the self-discipline needed to adhere to agency policies and guidelines are completely within their own control. He also highlights training, especially the study of fire behavior, as critical to a well-rounded program.

Putnam (2001) talks about the need to change the existing safety attitude from a passive negative attitude to an active concern that is fully supported by the Forest Service. Putnam proposes that real progress and change can only occur if the agency becomes a learning organization: learning from our mistakes and expanding our capacity to create the results we truly desire. Interviews with experienced firefighters contained the common thread of value and attitude change, as the solution that had the most “staying power.”

Veteran firefighters felt that many of the new and inexperienced firefighters lacked a deep respect for wildland fire and, in fact, were cavalier about the dangers. Shakespeare felt that, “best safety lies in fear” (Hamlet, Act 1, Scene 3). Firefighting is dangerous work. A fire shelter is a tool of last resort. If a fire shelter is the only option a firefighter has left, then the firefighter has probably failed not only himself or herself, but others as well. The firefighter can only hope (hope is not a plan) that the outcome of the deployment will be determined by a better decision (when and where to deploy) than by the decisions that put the firefighter in harm’s way.

## **Recommended Mitigation Actions**

The changes suggested by veteran firefighters to reduce the possibility of risk compensation when firefighters carry fire shelters include measures that need to be taken within the firefighting community and some that affect the public.

### **Internal Actions**

Provide adequate training materials, including the fire shelter video (NFES 1568) that explains the proper use and limitations of the fire shelter, during each year's refresher training. The upcoming revision of "The New Generation Fire Shelter" (NFES 2710) also needs to be in each attendee's hands. (Stutler, Anderson 2002).

Start telling the real story: firefighting is dangerous work, people have been killed, and people will be killed doing this job. All firefighters have the personal responsibility for their own safety and well-being. Be very frank about this message. Relay this message every year, every time. (Phenix, Cunningham, Rogers, Cuyler 2002).

Training for the mission needs to be more than just an early season, one-time shot. Firefighters, especially the front-line troops, need ongoing real-life scenarios, simulations, and proficiency drills. The major focus should be how to avoid entrapment and deployment situations. This mission-oriented training should occur throughout the fire season. Stutler said: "You fight as you train, and you train as you fight." (Stutler, M. McGee, J. McGee, Hollenshead 2002).

Integrate more fire behavior training, especially the critical factors that lead to blow-up conditions, in entry and intermediate-level courses. This needs to be hammered home; too little emphasis is given to the fuel, weather, and topographic parameters that influence extreme fire behavior. Emphasize situational awareness, respect, and "fear" of fire. Specific focus should be on initial attack incident commanders, single resource bosses, strike team leaders, and task force leaders. (Phenix, Gardner, Hupp, Lockwood, Rogers, Cuyler 2002).

Seek out the firefighters prone to at-risk behavior early in their careers; rehabilitate or remove them. There is no place in the firefighting world for a cavalier attitude. (Cunningham, Hollenshead, Lockwood, Cuyler 2002).

Recognize the “human factors” that are at work, and admit that personal and cultural factors are causing performance breakdowns and failures. Recognize that the role “human factors” play in fire accidents and fatalities appear to be dismissed, ignored altogether, or covered up. (Braun 1997, Mangan 1999, Putnam 2001, Rogers, Phenix, Gardner, Lockwood, Hollenshead, Graves 2002).

Realize that crew cohesion may be a significant factor in the way that individual crewmembers relate and react in the early, critical stages of an incident. This time is when some newly formed crews first try to perform as a unit. They are not usually successful. This is another “human factor” that needs to be quickly studied and understood (Graves, Phenix, Hollenshead 2002).

Collect comprehensive data concerning firefighter accidents and injuries, not just the physical causes, but also the human factors. Until we have true baseline data, we will continue reacting to symptoms rather than the disease (Braun 1997, Putnam 2001, Rogers 2002).

### **External Actions**

Some members of the firefighting community are concerned that the public might get the impression that the new fire shelter was designed to allow firefighters to be placed in more dangerous situations. All firefighting personnel, when asked about this concern, responded, “Just tell the truth.” The truth is that we teach, instruct, and train our firefighting troops to avoid deployment situations.

Firefighting is a dangerous occupation. Entrapments have occurred and will occur. If a firefighter becomes trapped, and has no option but to deploy a shelter, that shelter should provide the best possible chance of survival.



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J.D. Schindler received a bachelor's degree in forestry (1967) and a master's degree in forest recreation and wildlife (1968) from Southern Illinois University. He began working for the Forest Service as a smokechaser on the St. Joe National Forest (now part of the Idaho Panhandle National Forests) in 1966. He has worked on national forests throughout the Intermountain and Pacific Northwest Regions. He has extensive fire experience and is certified as a type 2 incident commander and as a type 1 operations chief, in addition to many other certifications. As district ranger of the Diamond Lake Ranger District (Umpqua National Forest) in 1995, he started a rappel group and became one of the first (if not the first) district ranger to rappel into a wildland fire. He retired in 2002 from the Umpqua National Forest Supervisor's Office.